

Be2000 User Manual: Table of Contents

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1 Front Panel Description

The front panel (see Section 16) features:

- One Alphanumeric green Display made of 8 digits
- Three Display made of 4 digits (seven segment red LEDs)
- Six red LEDs for alarm indication
- One yellow 'Fuel Level' LED warning
- One green 'Engine Running' LED
- Four yellow LEDs to indicate the Menu choice of the display
- One red LED to indicate the 'Warn.' Menu choice of the display
- Two yellow LEDs for mode display control
- One green 'AMF' LED for automatic operating mode indication
- Two green LEDs for the status of the Contactor indication

The pushbuttons are made of Membrane Switches and have the functions described below.

[^]: Up Cursor pushbutton, Display Menu selection

[v]: Down Cursor pushbutton, Display Menu selection

[<]: Left Cursor pushbutton, Parameter selection

[>]: Right Cursor pushbutton, Parameter selection

[START]: To Start the engine (must be used simultaneously to the [ENABLE] pushbutton)

[STOP]: To Stop the engine

[CLOSE]: To Close the contactor of the Generator (must be used simultaneously to the [ENABLE] pushbutton)

[OPEN]: To Open the contactor of the generator

[AUTO/MAN]: Auto or Manual control (must be used together with [ENABLE] push button)

[ENABLE]: Enable the use of [START] [CLOSE] and [AUTO/MAN] push buttons

[OFF]: Alarm Clear, Panel shut down

[ACK]: Acknowledge of alarm, Horn silence, Parameter reading

[A/V]: Mode Display control.

2 Manual Operating Mode

Press simultaneously [ENABLE] and [AUTO/MAN] until all LEDs illuminate. The menu selection will be automatically placed into the 'Data/h' and the message 'MANUAL' will appear. The 'KM' green LED will be turned on as indication of 'Load transferred to the Mains'.

The User now, can either select:

- To turn the Be2000 in 'OFF' operating mode by pushing the [OFF] pushbutton as described in Section 2.04.
- To turn the Be2000 in 'AUTO' operating mode by means of the [ENABLE] and [AUTO/MAN] pushbuttons as described in Section 3.02.
- To START and STOP the set by using [START][STOP] pushbuttons as described in Section 2.01 and 2.02.
- To select a menu for the Alphanumeric Display by using the [^] and [v] pushbuttons as described in Section 7.

2.01 Manual Start

Press the [ENABLE] and [START] pushbuttons simultaneously until engine starts. To enable the Start, the alarm memory must be cleared. To indicate the presence of alarm(s), the red 'Warn.' LED and the red alarm LEDs must be provided. To silence the Horn press the [ACK] pushbutton and to clear the alarm press the [OFF] pushbuttons. If a 'STOP cycle' is energized, wait for the end of the 'STOP SOLENOID' timing or, if the engine has already stopped, push again the [STOP] pushbutton to clear the STOP timing.

The green 'ENGINE RUNNING' LED will light if the engine runs. Further action on the [START] pushbutton will have no effect. If the 'PREHEAT' timing parameter is included in the Be2000 settings, a message [PREHEAT] will appear during the preheat timing.

During the starting motor insertion, the LEDs and Displays are turned off to save energy for the Be2000 internal circuits.

2.02 Manual Stop

Press the [STOP] pushbutton until the message **[STOPPING]** is displayed. At the end of the 'STOP' cycle, by pushing the [OFF] pushbutton, the Be2000 will be turned in the 'OFF' operating mode. If the engine is not running, it is possible to disable the 'STOP SOLENOID' cycle by pushing the [STOP] pushbutton. In this way, the operator can start the engine without waiting for the end of the 'STOP' cycle.

2.03 Manual Load Control

In Manual operating mode, the load is transferred to the Mains; this status is indicated by the green 'KM' LED. In order to transfer the load to the Generating-Set press the 'CLOSE' pushbutton simultaneously to the 'ENABLE' pushbutton. The 'KM' contactor will open and then, after a 2 seconds delay, if all parameters of the Generator are met, the KG will close.

In any moment, the contactor can be opened by the 'OPEN' pushbutton and the load is transferred back to the Mains.

2.04 OFF Operating mode

This mode is a low power consumption condition in which the Load is transferred to the Mains and the engine is stopped. The 'OFF' operating mode is indicated by the green 'KM' LED. To enter the 'OFF' operating mode push the [OFF] pushbutton directly.

3 Automatic Operating Mode

If the Be2000 is already in 'MANUAL' operating mode follow the instruction of Section 3.02 otherwise proceed to Section 3.01.

3.01 Set Up

- a)- simultaneously press 'ENABLE' and 'AUTO/MAN' until the 'LAMP TEST' takes place
- b)- the 'A.M.F.' green LED will not illuminate to indicate 'MAN' operating mode
- c)- the yellow 'Engine' Menu LED will illuminate to indicate the 'Data/h' Menu
- d)- the green LED 'KM' will be turned on as indication of 'Load transferred to the Mains'.

3.02 'Automatic' operating mode

e)- simultaneously press 'ENABLE' and 'AUTO/MAN' pushbuttons until the green 'A.M.F.' LED illuminates (A.M.F. means Automatic Mains Failure, automatic operating mode).

If the Mains is absent or fails, the Be2000 starts the engine after a programmable delay and transfers the load to the Generating-Set. If the Mains restores, the load is connected back to the Mains after a programmable delay and the Generating-Set stops after a Cooling down time.

3.03 Remote Controls

In 'AUTO' operating mode, the inputs '#JF7 GEN-SET TEST' and '#JM10 ENGINE TEST' are monitored. The 'ENGINE TEST' starts the engine and does not transfer the load to the Generator. If the 'GEN-SET TEST' is used, the Load is transferred to the Generator after the Warm-Up timing. A Cooling down time is included before stopping the engine. The 'GEN-SET TEST' input action overrides the 'ENGINE TEST' input action.

3.04 Mains Simulation

To simulate the Mains presence, the '#JC10 MAINS SIMULATION' is provided. It helps in case of total absence of the Mains. The status of the 'Mains simulation input' is displayed in the 'Power' menu with the messages **[EXT.ON]** and **[EXT.OFF]**. The Generating-Set will operate with the same timings of AUTOMATIC MAINS FAILURE. Mains Simulation has an important rule in keeping the Generating-Set stopped in particular situations, during the night for example. A truth table shows the possibilities:

<i>Display Message</i>	<i>MAINS STATUS</i>	<i>GENERATING-SET</i>
[EXT. ON]	Normal	Stand by mode
[EXT. OFF]	Normal	Stand by mode
[EXT. ON]	Failure	Stand by mode
[EXT. OFF]	Failure	Starting mode

3.05 Automatic operating mode: Stop

The Generating-Set stops automatically if Mains restores or the remote controls return to a stand by operating mode. The user can stop the Generating-Set in 'MANUAL' operating mode by pushing the [STOP] pushbutton. The user may press the [STOP] pushbutton in automatic operating mode but, in this case, the red 'EMERGENCY' LED alarm will energize and the Load will be transferred to the Mains. The use of the [OFF] push button shuts down the engine and drives the BE2000 in 'OFF' operating mode. In this case the 'EMERGENCY' does not energize.

3.06 Automatic operating mode: Timings and Parameters

The *Automatic Sequences* include the [FAILURE], [BREAKER], [RESTORE], [WARM UP] and [COOLING] timing parameters. In case of Mains failure, the Mains Contactors opens after the [BREAKER] time-out. The [FAILURE] timing takes place if the Mains Failure persists. After this time-out, the BE2000 starts the engine. The [WARM UP] allows the stabilization of the electrical parameters and engine temperature.

After the [WARM UP], if all electrical parameters are within the settings, the Contactor of the generator will close. If Mains restores the [RESTORE] timer starts to count and at the end the load is transferred to the Mains. After the [COOLING] time the Generating Set will stop.

The *Engine Starting Parameters* are controlled by the [PREHEAT], [CRANK], [REST], [ATTEMPTS], [CRANKOFF] and [STOPPING] parameters. The [PREHEAT], if used, energizes the *Preheat Output* before the starting attempts.

3.07 'Auto' or 'Manual' selection

a)- simultaneously press the 'AUTO-MAN' and 'ENABLE CONTROL' pushbuttons: the 'AUTO' and 'MANUAL' operating modes will toggle the A.M.F. status.

b)- the automatic operating mode is indicated by the green 'A.M.F' LED.

NOTE : every time that Vdc supply fails, the Be2000 internal program starts automatically in 'OFF' operating mode.

4 Phase Sequence Monitoring

The Be2000 compares the Phase Sequence of the Mains and Generator to an internal reference, clockwise. If the Mains Phase Sequence is counter clockwise, the 'Power' menu shows the message **[M-PH ERR]**. This is a *Mains Failure* condition and, according to the programmed timers, the Generating-Set will start. If the Phase Sequence of the Mains returns clockwise (and the Voltage /Frequency are within the settings) the Generating-Set will stop. If the Phase Sequence of the Generator is counter clockwise, the engine will shut down and the 'Warn.' Menu will show the message **[G-PHASES]**.

5 Display Features

The Be2000 has 4 displays: one *Alphanumeric Display* made of 8 green characters (SEE Section 6) and three 7-segment red *LED Display* made of 4 digits each (total of 12 digits). During starting attempts, all displays are placed in a low power condition to save energy for the microprocessor.

The three 4-Digit Displays can show electrical measurements of the Generator. The selection is made using the 'MODE' pushbutton.

6 Alphanumeric Display and Menu facilities

The display has five menus: 'Warn.'-'Program'-'Power'-'Data/h' and 'Engine'. The display control is made by using the [^], [v], [<], [>] and [ACK] pushbuttons.

Pushbutton usage in display mode:

[^] **Up Cursor** to select the Menu

[v] **Down Cursor** to select the Menu

[>] **Right Cursor** to browse the selected Menu

[<] **Left Cursor** to browse the selected Menu

[ACK] **Acknowledge** to display the value of the parameter

6.01 **WARN.' Menu, Alarm Messages**

Any incoming alarm, except for those indicated by the LEDs, is described by a Message in 'Warn.' Menu. The presence of a Message is indicated by the flashing red 'Warn.' LED. The user must select the 'Warn.' Menu by using [^] or [v] pushbuttons. The action on the [ACK] pushbutton has three effects:

- a)- turns the red 'Warn.' LED in a continuous illuminated mode
- b)- clear the message form the display if the alarm source has been removed
- b)- silences the Horn

Note: the Messages indicated by (*) are cleared only if 'Warn.' Menu is selected. In this way, the user is prompted to read the alarm before removing the message. The other messages are cleared only by using 'OFF' push button. In case of several alarm messages the use of the [<] / [>] pushbuttons scan the alarm messages contained in the 'Warn.' menu memory. The list of the messages follows.

<u>Message Description</u>	<u>Display [MESSAGE]</u>
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SPEED Alarm Messages

- Under Speed shut down: [U/SPEED]
- Pick Up Failure shut down: [FAULT 05]
- Pick Up Failure calibration error: [FAULT 07]

GENERATOR Alarm Messages

- Under Frequency shut down:..... [UNDER Hz]
- Over Frequency shut down: [OVER Hz]
- Over Current shut down: [OVER Aac]
- Over Current warning:..... [WARN Aac]
- #'JF4 input' Overload shut down [OVERLOAD]
- Generator Phase Sequence error [G-PHASES]
- Over Voltage shut down: [OVER V]
- Under Voltage shut down:..... [UNDER V]
- Alternator Failure shut down:..... [GEN.FAIL]
- Over Active Power shut down: [OVER KW]
- Over Apparent Power shut down:..... [OVER KVA]

OIL PRESSURE Alarm Messages

- #JM7 Low Oil Pressure warning:..... [WARN OIL](*)
- #JM7 Oil Sender Failure warning: [FAULT 02] (*)
- Oil pressure Switch Failure:..... [FAULT 06]

TEMPERATURE Alarm Messages

- #JM6 High Temperature warning: [HI TEMP] (*)
- #JM6 Temperature Sender failure warning: [FAULT 03] (*)
- #JF6 'Temperature 2' shut down..... [TEMPER 2]

BATTERY and FUEL Alarm Messages

- Low Battery Voltage warning [LO BATT]
- High Battery Voltage warning [HI BATT]
- #JM8 Low Level Fuel warning [LO FUEL] (*)
- #JM8 Fuel Level Sender failure warning..... [FAULT 04] (*)
- #JM8 Maximum Level Fuel warning [HI FUEL] (*)
- #JF2 Fuel, Level Switch shut down..... [FUEL END]

MISCELLANEOUS Alarm Messages

- Be2000 internal failure alarm: [FAULT 01]
- Service Schedule Time out prompt: [SERVICE]
- 'JF1 Alarm 1' shut down: [ALARM 1]
- 'JF8 Alarm 2' shut down: [ALARM 2]

6.02 Program' Menu: [VIEW>] Display Mode

The 'Program' Menu is indicated by the yellow 'Program' LED and is obtained using [^] or [v] pushbuttons. There are a [VIEW>] mode, to read the programmable parameters, and a [SET-UP] mode to read and to modify the parameters.

The [VIEW>] mode is always available, the [SET-UP] mode is only available in Programming proceedings (not available to the user).

As the [VIEW>] message appears on the display, the user can view the parameters. The messages of the first column, indicated below, are the name of the parameters. The messages in the second column are the parameter settings displayed by pushing the 'ACK' pushbutton. The indicated settings are the factory set defaults. These values may be changed using the programming proceedings. We recommend to write down the modification made on the parameters as described in the 'Programming' section.

[FAILURE] [5 sec]	Mains Failure Delay: 0-59 seconds or 1-15 minutes. The Be2000 will initiate the engine start proceedings if the Mains Failure (Over/Under Voltage, Over/Under Frequency or Phase Sequence) persists for the [FAILURE] timing. This timer is energized after the [BREAKER] timing.
[RESTORE] [5 sec]	Mains Restore Time: 0s to 59 seconds or 1-15minutes. The Generating-Set will transfer the Load to the Mains if the Mains parameters stay stable for the [RESTORE] timing.
[BREAKER] [5 sec]	Mains Contactor Delay: 0s to 59 seconds or 1-15minutes. If a Mains Failure persists (Over/Under Voltage, Over/Under Frequency or Phase Sequence outside the settings) for the [BREAKER] timing, the contactor opens. If the Mains remains stable (Over/Under Frequency, Over/Under Voltage and Phase Sequence within the settings) for the [RESTORE] time the contactor closes.
[M OVERV] [480 V]	Mains Over Voltage Threshold: 80 Vac to 999 Vac. If the voltage rises above this setting there is a Mains Failure condition and the [BREAKER] timer starts to count. The setting over the 999 is the [INHIBIT] message that indicates that the protection is not operative.
[M UNDERV] [320 V]	Mains Under Voltage Threshold: 70 Vac up to 990 Vac. If the voltage drops below the setting there is a Mains Failure condition and the [BREAKER] timer starts to count. The setting below 70 is the message [INHIBIT] that indicates that the protection is not operative.
[M OVERHz] [55.0 Hz]	Mains Over Frequency Setting: 50 Hz up to 99 Hz. The Over Frequency is considered to be a Mains Failure state and the [BREAKER] timer starts to count. The setting over 98 is the code [INHIBIT] that inhibits the Over Frequency.
[M UND/Hz] [48.0 Hz]	Mains Under Frequency Threshold: 1Hz to 99Hz. The Frequency below the setting causes a Mains Failure and the [BREAKER] timer starts to count. The setting below 1Hz is the code [INHIBIT] that disables the Under Frequency.
[G OVERV] [480 V]	Generator Over Voltage Shut Down: 80 Vac to 999 Vac. If the generator voltage rises above the setting by the [T OVERV] time the Generating Set shuts down. The [INHIBIT] setting (over 999) disables the Over Voltage protection.
[T OVERV] [1 sec]	Over Voltage Protection Timing: 1 second up to 15 seconds.
[G UNDERV] [320 V]	Generator Under Voltage Setting: 70 Vac to 990 Vac. If the voltage of the Generator drops below this setting by the [T UNDERV] time, the Generating Set shuts down. The [INHIBIT] setting (below 70) inhibits the protection. The Under Voltage protection works only if the Contactor of the generator is closed.
[T UNDERV] [5 sec]	Under Voltage Protection Timing: 1 second up to 15 seconds

- [G OVERHz] [55 Hz]Generator Over Frequency Threshold:** 50-99 Hz. The Generating-Set shuts down if the Over Frequency persists for the [T OVERHz] timing. The setting over the 99 value is the[INHIBIT] code and the Over Frequency protection is disabled.
- [T OVERHz] [1 sec].....Over Frequency Protection Timing:** 1 second up to 15 seconds
- [G UND/Hz] [48 Hz]Generator Under Frequency Setting:** [INHIBIT], 1Hz up to 99Hz.The Generator Set shuts down if the Frequency stays below the setting by the [T UND/Hz] timing. Below the setting of 1Hz the code [INHIBIT] disables the Under Frequency. The Under Frequency protection works only if the Contactor of the generator is closed.
- [T UND/Hz] [6 sec]Under Frequency Protection Timing:** 1 second to 15 seconds
- [OVER KW] [INHIBIT].....Over Power kW Trip Setting:** 10kW up to 5000 kW and [INHIBIT] (disabled),with an action delayed for 30 seconds (Section 8.1.12).
- [OVER KVA] [INHIBIT].....Over Power kVA Trip Setting:** 10kVA up to 5000 kVA and [INHIBIT],with an action delayed for 30 seconds(Section 8.1.12).
- [OVER Aac] [INHIBIT]Over Current Shut Down Setting:** 10Aac up to 9990Aac and [INHIBIT] (Over Current inhibited) (Section 8.1.13).
- [T OVER A] [6 sec]Over Current Shut Down Timing:** 1-59 sec, 1-15 minutes
- [WARN Aac] [INHIBIT]Over Current Warning Setting:**10Aac up to 9990Aac [INHIBIT] (Warning inhibited), (Section 8.1.13).
- [T WARN A] [6 sec]Over Current Warning Timing:** 1-59 sec, 1-15 minutes.
- [PREHEAT] [INHIBIT]Engine Glow Preheat Time :** 1-59 sec.This timing energizes the #JC1 output before the starting attempts. Below the 1 second setting, the [INHIBIT] code indicates the inhibition of the Preheat.
- [CRANKOFF] [300 RPM].....Crank Termination Speed Threshold:** up to 2000 RPM, to terminate the starting motor insertion.
- [ATTEMPTS] [3].....Number of Attempts.** to start the engine (3-15 attempts, out.#JC6)
- [CRANK] [5 sec]Cranking Time.** Maximum insertion time of the starting motor (3-15 sec.).The timing stops if the engine runs.
- [REST] [5 sec].....Rest Time.** Pause of time between the starting attempts (3-15 sec.).If preheat is used, the Preheat output remains energized during [REST] time.
- [WARM UP] [5 sec]Off Load Generating-Set Running:** 0-59 seconds or 1-15 minutes. The Warm-Up time allows to the critical parts to reach the recommended operating temperature before closing the Contactor of the Generator.
- [COOLING] [15 sec]Cooling Down Time:** 0-59 seconds or 1-15minutes. This timing allows the Alternator Cooling. The contactor opens, the engine runs off Load to cool the alternator, and then the engine will stop.
- [STOP] [20 sec]Stop Cycle:** energized to Stop Solenoid 1-99sec. This timer energizes the output #JC4 and keeps the message [STOPPING] on the display.
- [OV/SPEED] [INHIBIT]Over Speed Setting:** 100-4000 rpm and [INHIBIT]. The protection has a programmable delay up to10 second.
- [T OV/SPD] [1 sec]Over Speed Timing:** delay of the Over Speed protection,1sec up to 10 seconds.
- [UNDSPEED] [INHIBIT]Under Speed Setting:** [INHIBIT] or 100 to 4000 rpm. The protection is delayed [T UN/SPD] seconds (Section 8.1.15) and is enabled only if the Contactor of the Generator is closed.
- [T UN/SPD] [6 sec]Under Speed Timing:** delay of the Under Speed protection, 1 sec. Up to 10 seconds.

- [WARN OIL] [INHIBIT]Low Oil Pressure Warning Threshold:** 0.1-20.0BAR. (Section 8.1.2) If the Oil pressure drops below the setting for 15 seconds the Message warning will energize. Below the 0,1BAR setting the code [INHIBIT] indicates the inhibition of the measurement reading and monitoring.
- [WARN TEM] [INHIBIT]High Temperature Warning Threshold:** 40-250°C. (Section 8.1.5). If the High Temperature rise above the setting for 15 seconds the warning Message alarm will energize. Over the 250°C setting, the code INHIBIT indicates the inhibition of the Temperature reading and monitoring.
- [HORN] [1 min]Alarm Horn Time-out:** (Output #JC2) 5-59 seconds and 1-15 minutes. The setting over 99 is the [NO STOP] setting for continuous operation: the user must silence the horn by means of the 'ACK' pushbutton. Further details are explained in Section 8.
- [LO FUEL] [INHIBIT].....Minimum Fuel Level Warning Setting.** (1-99%) A 15 seconds' delay is provided to filter out noise on the level measurement. The setting below 1% is indicated as [INHIBIT] to disable the alarm.
- [HI FUEL] [INHIBIT].....Maximum Fuel Level Warning Setting.** (1-99%) A 15 seconds' delay it is provided to filter out noise on the level measurement. The setting over 99% is indicated as [INHIBIT] to disable the alarm.
- [TEETH N.] [INHIBIT]Number of Teeth of the Flywheel:** [INHIBIT], 1 to 500 teeth. The [INHIBIT] code disables the Speed-reading, the Over/Under Speed protection and the [CRANK OFF] proceedings.
- [OUTPUT 1] [--]Programmable Output 1(see below)**
- [OUTPUT 2] [--]Programmable Output 2(see below)**
- [OUTPUT 3] [--].....Programmable Output 3.** It is possible to transfer to the programmable outputs the status of a particularly Status or Alarm. The following table includes all possibilities.
- | Message | Operating Meaning |
|------------|--|
| [--] | Output not used |
| [AUTO] | The BE2000 is placed in AUTO operating mode |
| [OIL] | Includes Oil Pressure warnings and shut downs |
| [TEMPERAT] | Includes Engine Temperature warnings and shut downs |
| [ALTERNAT] | Includes: O/U Voltage, Overload and O/U Frequency |
| [GEN-SET] | Includes: Oil Pressure, Temperature, Fail to Start alarm, O/U Speed ,FAULT07 and FAULT05 |
| [ALARMS] | Includes all Alarms, Warnings and Shut Downs |
| [SERVICE] | Indicates the time-out for the Generating Set SERVICE proceedings |
- [ALARM 2] [n.o].....Alarm 2 Switch Polarity (input #JF8):** normally Open or Closed selection
- [TEMPER.2] [n.o]Temper. 2 Switch Polarity (input #JF6):** normally Open or Closed selection
- [PHASES] [3-PHASE].....3-Phase /1-Phase Mode.** In 3-phase system operation the connection to the Generating Set is via 4-wire wiring: L1-L2-L3-N.The connection on the Mains side is via 3-wire wiring: R-S-T. In a Single-Phase connection the Generator wires are L1 and N (L1-L2 are open) and the Mains wires are R (Line) and T (Neutral).
- [C.T.SIZE] [500/5 A]Current Transformer Size:** 50A/5Aac up to 9900Aac/5Aac
- [Vac RATIO] [X1]Reading Ratio.** The X1 mode is the normal reading mode. The display range is up to 600Vac Phase to Phase or 346Vac Phase to Neutral. The X2 operating mode requires an external adapter (/2 divider) to extend the reading up to 1000Vac Phase to Phase or 578Vac Phase to Neutral.
- [SLAVE N.] [1].....RS485 Node Address.** To allow multi-communication it is possible to connect on the same link up to 9 units (slave number [1] up to [9]).

6.03 POWER menu

This menu shows electrical measurements, Mains Simulated Status and Phase Sequence Status. The letter 'XX.X' and 'XXXX', indicated below, mean a numeric field up to 4 digits. It is possible to read the display content by using [<] and [>] pushbuttons. If some parameters have additional numerical message (e.g. [kVAr 1]) the user must press the [ACK] pushbutton in order to read the value.

Generating-Set (Phase L1) Reactive Power kVAr units: up to 9990 kVAr	[kVAr 1] [XXXX]
Generating-Set (Phase L2) Reactive Power kVAr units: up to 9990 kVAr	..... [kVAr 2] [XXXX]
Generating-Set (Phase L3) Reactive Power kVAr units: up to 9990 kVAr	..... [kVAr 3] [XXXX]
Total Reactive Power kVAr units: up to 9990 kVAr	..... [XXXX kVAr]
Total Apparent Power kVA units: up to 9990 kVA	..... [XXXX kVA]
Total Active Power kW units: up to 9990 kW	..... [XXXXkW]
Generating Set Power Factor	..... [PF X.XX]
Generator Frequency	..... [G XX.XHz]
Generator Rotation Phase clockwise (*)	..... [G.PH OK]
Generator Rotation Phase counter clockwise (*)	..... [G.PH ERR]
Generator Rotation Phase not available (e.g. Single Phase Mode) (*)	..... [G.PH --]
Mains Simulation Disabled (Mains Monitoring Mode) (**)	..... [EXT.OFF]
Mains Simulation Enabled (#JC10 Switch input) (**)	..... [EXT. ON]
Mains Voltage Vr to Vs	..... [Vrs XXXX]
Mains Voltage Vs to Vt	..... [Vst XXXX]
Mains Voltage Vr to Vt	..... [Vrt XXXX]
Frequency of the Mains voltage	..... [M XX.XHz]
Mains Phase Rotation counter clockwise (***)	..... [M.PH OK]
Mains Phase Rotation clockwise (***)	..... [M.PH ERR]
Mains Phase Rotation not available (e.g. Single Phase Mode) (***)	..... [M.PH --]

(*)(**)(***) Note: only one message is displayed according to the real Status.

6.04 DATA/h' Menu

By using the [<] or [>] pushbuttons, the following additional sub menu and parameters are available.

- **A)** Operating Messages Menu
- **B)** Hour Counter
- **C)** Service Schedule Alarm, Counter Status and Settings

A) Operating Messages Menu

The display informs the user regarding the internal task of the Be2000. The messages are automatically displayed and removed according to the internal status. The list of the messages follows.

[MANUAL].....	Be2000 is Manual operating mode
[M FAULT].....	Indication of 'Mains Failure' and 'Breaker' timing cycle. The Be2000 counts the programmed 'Mains Failure Delay' time before starting the engine.
[PREHEAT].....	Preheat cycle in progress.
[START].....	Crank cycle in progress. The message is displayed 1 second before the crank attempt. The display is then turned off to save energy for the microprocessor. The display returns to a normal operation when the starting cycle has been completed.
[WARM UP].....	'Off Load Running' timing cycle. The unit is waiting the Warm-Up time-out before closing the Contactor of the Generator.
[LOAD].....	The Generating-Set is running on load.
[COOLING].....	'Cooling Down' timing cycle.
[STOPPING].....	'Stop Solenoid' excitement cycle.
[RESTORE].....	Indication of a 'Mains Restore' cycle. The Be2000 counts the programmed 'Mains Restore' time before opening the Generator Contactor.
[SET TEST].....	Indication of a 'Generating-Set Test' cycle.
[ENG.TEST].....	Indication of a 'Engine Test' cycle.

[STANDBY] The Be2000 is waiting for a Mains Failure or for the Remote Test.

[WAIT GEN] The Be2000 is waiting for the stabilization of the electrical parameters of the generator. As the Voltage and Frequency meet the programmed settings the [WARM-UP] timing will take place and the 'Generator Available' static output energizes.

B) Hour Counter

The Hour Counter can record up to [99999h].

The Clear Counter proceedings are described in section 7.6.10.

C) Service Schedule Prompt

The display indicates, in the form **[SERV XXX](*)**, the remaining number of hours to energize the Service Prompt Alarm. By pushing the [ACK] pushbutton the **[SET XXX]** message will appear to indicate the *Scheduled Timing* setting. The timer counts down if the engine is running. As the counter reaches the zero count, the Common Alarm (#JC2) energize and the message **[SERVICE]** remains in the 'Warn.' Menu.

To clear or to modify the Scheduled Timing setting follow the recommendation of the Generating Set manufacturer.

(*) Note: XXX means a 3-Digit numerical field (up to 999h)

6.05 ENGINE Menu

If the 'Engine' Menu is selected the yellow 'Engine' LED will light and, by using [<] or [>] pushbuttons the user can see:

- Engine Speed indication up to 4000 R.P.M.: **[XXXX RPM] (*)**
- Oil Pressure indication up to 25.6 Bar: **[XX.X BAR]**
- Engine Temperature indication up to 256 °C: **[XXX °C]**
- Battery Voltage measurement up to 33.0Vdc : **[XX.X Vdc]**
- Tank Fuel Level indication in the range 0% to 99%: **[FUEL XX%]**
- Charging Alternator Voltage up to 33.0Vdc: **[D+XX.XV]**

(*)Note: the symbol 'X' means one Digit of numerical value

7 Alarm description

- a) The alarms are indicated by the red LEDs and by means of a set of Messages on the 'Warn.' Menu. (see Section 6.0.1). The LEDs flashes until the operator press the 'ACK' pushbutton (Acknowledge proceedings).
- b) The alarm energizes the 'COMMON ALARM' output relay. This relay is de-energized by pushing the 'ACK' pushbutton or when the internal timer **[HORN]** has reached its count. This output is normally connected to a Horn or a Siren. If the **[HORN]** is in [NO STOP] (continuous) mode, the use of the [ACK] pushbutton is the only way to silence the horn.
- c) After the alarm acknowledge, the LED will stay continuously illuminated. To clear the alarm(s), the user must remove the alarm source and then press the [OFF] pushbutton.

A detailed list of alarms and additional information follows.

1.1.1 Low Oil Pressure Switch Shut Down

- Red LED on front panel indicating **'OIL PRESSURE'** shut down.
- Oil Pressure Switch Failure Message in the 'Warn' Menu: **[FAILURE 06]**

1.1.2 Low Oil Pressure Sender Warning

- Programmable threshold for Oil Pressure warning (Section 6.0.2): **[PRESSURE] [--- bar]**
- 'Open Sender'(>2000 OHM) message in the 'Warn.' Menu (Section 7.1.3): **[FAULT 02]**

1.1.3 High 'Temperature 1' Shut Down

- Red LED on front facia indicates **'TEMPERATURE'** shut down.

1.1.4 High 'Temperature 2' Shut Down

- Shut Down message in the 'Warn.' menu: **[TEMPER 2]**

1.1.5 High Temperature Warning

- Programmable Temperature warning (Section 6.0.2): **[WARN TEM][--- °C]**
- 'Open-Sender' (>2000 OHM) message in the 'Warn.' Menu (section 7.1.4): **[FAULT 03]**
- Sender 'High Temperature' message in the 'Warn.' menu: **[HI TEMP]**

1.1.6 Fail to Start Shut Down

- Programmable Number of attempts (Section 6.0.2): **[ATTEMPTS] [XX]**
- Maximum Cranking insertion time (Section 6.0.2): **[CRANK] [XX sec]**
- Interval time between Crank attempts (Section 6.0.2): **[REST]. [XX sec]**
- Red LED on front facia indicates **'FAIL TO START'** shut down

1.1.7 Charger Failure Shut Down

- This alarm refers to the 'Belt Break' condition: the engine is running but the Charging Alternator voltage is below the above indicated settings.
- Red LED on front facia indicating **'CHARGER FAILURE'**.

1.1.8 External Stop Shut Down

- Red LED on front cover indicates **'EMERGENCY'**.
- This alarm is energized, also, by the **[STOP]** pushbuttons if the Be2000 is in 'AUTO' operating mode.

1.1.9 Over Frequency Shut Down

- Threshold setting is user programmable (Section 6.0.2): **[G OVER Hz] [XX Hz]**
- The engine shuts down after the **[T OVER Hz]** programmable delay
- Alarm message in the 'Warn.' menu: **[OVER Hz]**

1.1.10 Under Frequency Shut Down

- Threshold setting is user programmable (Section 6.0.2): **[G UND/Hz] [XX Hz]**
- The engine stops after the **[T UND/Hz]** programmable delay.
- Alarm message in the 'Warn.' menu: **[UNDER Hz]**

1.1.11 Fuel Level Shut Down and Warning

- Low Level Fuel from a level switch source:
 - Yellow LED on front facia indicates **'FUEL'**
- No Fuel in the Tank from a level switch source:
 - Alarm message in the 'Warn.' menu: **[FUEL END]**
- Low Level Fuel in the Tank from a level Sender source:
 - Level programming parameter (Section 6.0.2): **[LO FUEL] [XX%]**
 - Alarm message in the 'Warn.' menu: **[LO FUEL]**
- Max Level Fuel in the Tank from a level Sender source:
 - Level programming parameter (Section 6.0.2): **[HI FUEL] [XX%]**
 - Alarm message in the 'Warn.' menu: **[HI FUEL]**
- Fuel Sender Failure
 - Alarm message in the 'Warn.' menu: **[FAULT 04]**

1.1.12 Power Alarm 'kW' / 'kVA' Shut Down

- The 'kW' setting is programmable (Section 6.0.2): [OVER kW][XXXX kW]
- The 'kVA' setting is programmable (Section 6.0.2): [OVER Kva] [XXXX kVA]
- Alarm message in the 'Warn.' menu: **[OVER kW]**
- Alarm message in the 'Warn.' menu: **[OVER kVA]**

1.1.13 Over Current and Overload Shut Down

- Overload message (from external Over Current relay): **[OVERLOAD]**
- Over Current Shut Down setting (Section 6.0.2): [OVER Aac][XXXX Aac]
- Programmable delay (Section 6.0.2): [T OVER A][XXX sec]
- Over Current Shut Down message in the 'Warn.' menu: **[OVER Aac]**
- Over Current Warning setting (Section 6.0.2): [WARN Aac][XXXX Aac]
- Programmable delay (Section 6.0.2): [T WARN A][XX sec]
- Over Current Warning message in the 'Warn.' menu: **[WARN Aac]**

1.1.14 Over/Under Voltage/Generator Failure Shut Down

- Over Voltage setting is programmable (Section 6.0.2): [G OVER V] [XXX Vac]
- Over Voltage delay is programmable (Section 6.0.2): [T OVER V] [XX sec]
- Over Voltage alarm message in 'Warn.' menu: **[OVER V]**
- Under Voltage setting is programmable (Section 6.0.2): [G UND/V] [XXX Vac]
- Under Voltage setting is programmable (Section 6.0.2): [T UNDERV] [XX sec]
- Under Voltage alarm message in 'Warn.' menu: **[UNDER V]**
- Under Voltage shut down includes a cooling down time: [COOLING] [XXX sec]
- Error in the phase sequence message : **[G-PHASES]**
- Total absence or insufficient alternator Voltage/Frequency output: **[GEN.FAIL]**

1.1.15 Speed Shut Down

- Pick-up ratio user programmable : [TEET N] [XXX n°]
- Programmable Over Speed setting: [OV/SPEED] [XXXRPM]
- Over Speed bypass delay setting: [T OV/SPD][XXX sec]
- Over Speed indication: red LED on front facia indicating **'OVERSPEED'**
- Under Speed settings user programmable (Section 6.0.2): [UNDSPEED] [XXX RPM]
- Under Speed message on 'Warn.' menu: **[U/SPEED]**
- Under Speed bypass delay is programmable:[T UN/SPD][XXX sec]
- Loss of Speed Signal Shutdown/Pick Up Failure message: **[FAULT 05]**

1.1.16 'Alarm 1'/'Alarm 2' Shut Down

- 'Alarm 1' display message in the 'Warn.' menu: **[ALARM 1]**
- 'Alarm 2' display message in the 'Warn.' menu: **[ALARM 2]**
-

1.1.17 Battery Voltage Warning

- The High and Low Battery Voltage alarms are automatically monitored: High V=15Vdc, Low V=11.8Vdc (24V Battery system: High V=30Vdc, Low V=23,6Vdc)
- Warning message in the 'Warn.' menu: **[LO BATT] [HI BATT]**

1.1.18 Service Prompt Alarm (See the Generating Set manufacturer recommendation)

8 SOFTWARE DESCRIPTION

The Be2000 communicates to a Computer via RS232 serial interface. The software performs full control/monitor of the Generating-Set. It supports remote monitoring via phone line and supports monitoring on site too.

9 Troubleshooting

The following troubles are carried out by qualified personnel only:

- a) **Be2000 LEDs are dark**
- b) **Be2000 LEDs and Display have a very low intensity light**
- c) **The reading of the Battery Voltage is not stable**
- d) **The reading of the Generator Current is unstable or incorrect**
- e) **The Generator Voltage and 'PF' measurements are incorrect**
- g) **Be2000 does not START or STOP the engine**
- h) **Engine stops without any apparent reason after few seconds or minutes**
- i) **The inputs does not energize the Be2000**
- l) **The display shows the [FAULT XX] messages (Sender or Pick-Up failure)**

The following behaviours can be simply find out: (it is recommended to select the message operating mode of the display as indicated in section 6.04A)

A) The Mains fails but the BE2000 does not start the engine

- check if the Be2000 is placed in the AUTOMATIC operating mode (A.M.F. LED)
- the green 'KM' LED indicates a normal situation and the timers [FAILURE] and [BREAKER] are counting the preset timing: wait for the time out condition
- the green 'KM' LED indicates a normal situation and the operating message indicates '[STANDBY]': there is a failure of the Mains Contactor or abnormal setting in Mains parameters.
- Check the setting of the Mains Failure parameters : Over/Under Voltage and Frequency
- Check the setting of the [FAILURE],[RESTORE] and [BREAKER] timers
- Be2000 is counting one of the timers ([FAILURE] and [BREAKER]). In this case the message [M FAULT] must be present on the operating message menu (see section 6.04-A)
- the MAINS SIMULATION feature is used: check the message [EXT ON] and [EXT OFF] as described in section 3.04
- the stop solenoid is working: message [STOPPING] on the display: *wait for the time out.*
- there are Alarm on the front panel: check all red LEDs and the flashing red 'Warn.' Menu.
- the green 'ENGINE RUNNING' LED is lit: by an abnormal situation an external input triggers the Engine Running status

B) The engine starts but the BE2000 does not close the Contactor (KG)

- if the display indicates [WARM UP]: wait for the end of warm up time out
- if the display indicates [WAIT GEN]: some electrical parameter of the generator does not meet the settings (Over/Under Voltage, Frequency, Speed)
- the Be2000 is not anymore in automatic operating mode
- the green KG LED is lit : failure of the contactor

C) The BE2000 opens the Contactor (KG)

- some electrical parameters, due to external conditions, are outside of the setting: one or more alarm have to be seen on the front panel
- Mains restores or Mains simulates: message [RESTORE] in the display
- Be2000 is not in Automatic operating mode

C) The BE2000 opens the Contactor (KG) but the engine does not stop

- the Be2000 is counting the cooling down time (message [COOLING] on the display)
- the ENGINE TEST remote control has been energised
- Be2000 is not in Automatic operating mode
- a new cycle has been initiated by Mains Failure

10 Fault Codes

Listed below, are the displayed FAULT messages into the 'Warn.' Menu.(see also Section 6.0.1A)

[FAULT 01]: the Be2000 has an internal memory failure. It is possible to recover the normal operating mode of the Memory by using the System Utility (Qualified personnel only).

[FAULT 02]: Oil Sender Failure or Open Circuit detection

[FAULT 03]: Temperature Sender Failure or Open Circuit detection

[FAULT 04]: Fuel Level Sender Failure or Open Circuit detection

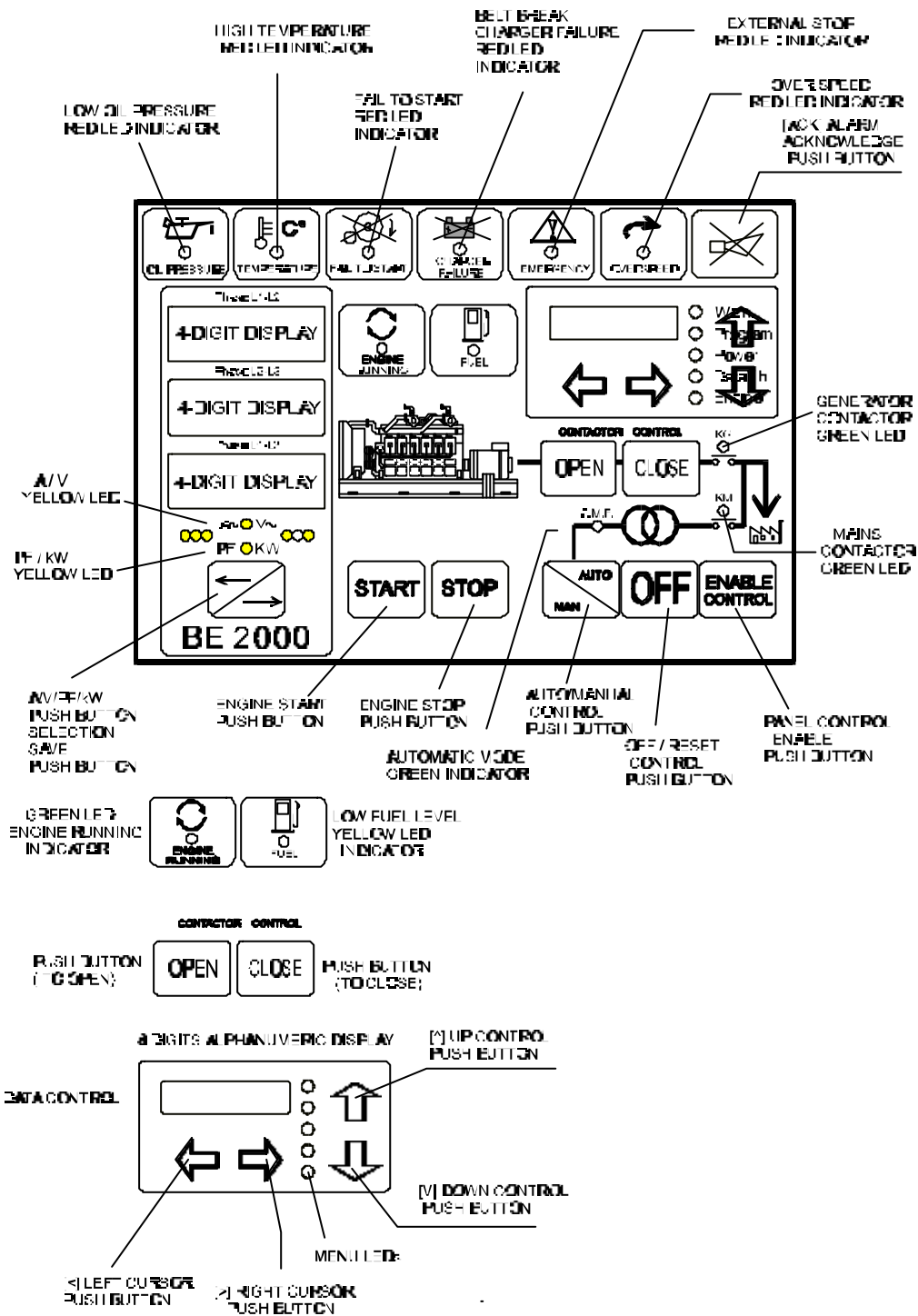
[FAULT 05]: Pick-Up Failure or Open Circuit detection

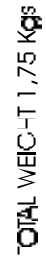
[FAULT 06]: Oil Pressure Switch Failure or Open Circuit detection

[FAULT 07]: Pick-Up error, the detected speed is below the Under Speed setting for 150 seconds.

The alarm is monitored during the Warm Up time if the Frequency is within the settings.

Section 16.00: Be2000 Front Panel



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13.0 Installation and Plant Information

We recommend to write down, between the square brackets ([.....]), all modifications made on the factory default parameters. To help Your customer please fill the following form.

PANEL Serial N°		PANEL Model/Rating	
GEN-SET Serial N°		GEN-SET Model/KVA	
BE2000 Serial N°		SOFTWARE Version	
MANUFACTURER NAME		TELEPHONE / FAX	
DATE		SIGNATURE	

[MAINS >] PARAMETERS

[FAILURE] [.....]	MAINS Failure Delay
[RESTORE] [.....]	MAINS Restore Time
[BREAKER] [.....]	MAINS Contactor Delay
[M OVERV] [.....]	MAINS Over Voltage
[M UNDERV] [.....]	MAINS Under Voltage
[M OVERHz] [.....]	MAINS Over Frequency
[M UND/Hz] [.....]	MAINS Under Frequency

[ENGINE>] PARAMETERS

[PREHEAT] [.....]	Engine Glow Preheat Time
[ATTEMPTS] [.....]	Number of Attempts
[CRANK] [.....]	Cranking Time
[REST] [.....]	Rest Time
[WARM UP] [.....]	Off Load Generating-Set Running
[COOLING] [.....]	Cooling Down Time
[STOP] [.....]	Stop Solenoid Timing
[OV/SPEED] [.....]	Over Speed Setting
[T OV/SPD] [.....]	Over Speed Timing
[UNDSPEED] [.....]	Under Speed Setting
[T UN/SP] [.....]	Under Speed Timing
[CRANKOFF] [.....]	Crank Termination Setting
[TEETH N.] [.....]	Number of Teeth
[WARN OIL] [.....]	Low Oil Pressure Warning Threshold
[WARN TEM] [.....]	High Temperature Warning Threshold

[GENSET >] PARAMETERS

[G OVERV] [.....]	Generator Over Voltage Setting
[T OVERV] [.....]	Over Voltage Protection Timing
[G UNDERV] [.....]	Generator Under Voltage Setting
[T UNDERV] [.....]	Under Voltage Protection Timing
[G OVERHz] [.....]	Generator Over Frequency Setting
[T OVERHz] [.....]	Over Frequency Protection Timing
[G UND/Hz] [.....]	Generator Under Frequency Setting
[T UND/Hz] [.....]	Under Frequency Protection Timing
[OVER KW] [.....]	Over Power kW trip Setting
[OVER KVA] [.....]	Over Power kVA Trip Setting
[OVER Aac] [.....]	Over Current Shut Down Setting

[T OVER A] [.....]	Over Current Shut Down Timing
[WARN Aac] [.....]	Over Current Warning Setting
[T WARN A] [.....]	Over Current Warning Timing
[HORN] [.....]	Alarm Horn Control

[FUEL >] PARAMETERS

[LO FUEL] [.....%]	Minimum Fuel Level Warning Setting
[HI FUEL] [.....%]	Maximum Fuel Level Warning Setting

[SENSORS >] PARAMETERS

Oil Sender Relationship

[P1] [Ohm]	Relationship Bar Oil Pressure to Ohm point #1
[P2] [Ohm]	Relationship Bar Oil Pressure to Ohm point #2
[P3] [Ohm]	Relationship Bar Oil Pressure to Ohm point #3
[P4] [Ohm]	Relationship Bar Oil Pressure to Ohm point #4
[P5] [Ohm]	Relationship Bar Oil Pressure to Ohm point #5
[P6] [Ohm]	Relationship Bar Oil Pressure to Ohm point #6

Temperature Sender Relationship

[T1] [Ohm]	Relationship °C Temperature to Ohm point #1
[T2] [Ohm]	Relationship °C Temperature to Ohm point #2
[T3] [Ohm]	Relationship °C Temperature to Ohm point #3
[T4] [Ohm]	Relationship °C Temperature to Ohm point #4
[T5] [Ohm]	Relationship °C Temperature to Ohm point #5
[T6] [Ohm]	Relationship °C Temperature to Ohm point #6

Fuel Sender Relationship

[F1 %] [Ohm]	Relationship Level 00 % to Sender resistance in Ohm
[F2 %] [Ohm]	Relationship Level 20% to Sender resistance in Ohm
[F3 %] [Ohm]	Relationship Level 40% to Sender resistance in Ohm
[F4 %] [Ohm]	Relationship Level 60% to Sender resistance in Ohm
[F5 %] [Ohm]	Relationship Level 80% to Sender resistance in Ohm
[F6 %] [Ohm]	Relationship Level 100% to Sender resistance in Ohm

[I/O >] PARAMETERS

[OUTPUT 1] [.....]	Programmable Output 1
[OUTPUT 2] [.....]	Programmable Output 2
[OUTPUT 3] [.....]	Programmable Output 3
[ALARM 2] [.....]	Alarm 2 Switch Selection
[TEMPER.2] [.....]	Temperature 2 Switch Selection

[SETTING>] PARAMETERS

[PHASES] [.....]	3-Phase /Single Phase Selection
[C.T.SIZE] [.....]	Current Transformer Size
[Vac RATIO][.....]	Voltage Reading Ratio
[MODE]	Display Control
[SLAVE N.] [.....]	Node Address

[SERVICE] SCHEDULED SERVICE

[SET.....]	Scheduled Service Interval Timing (hours)
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